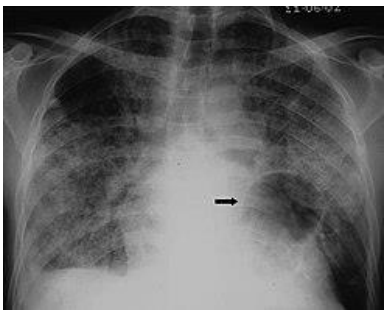
Infectious Diseases

Case 1: 28 year old male c/o dyspnea, chest pain, non-productive cough, and fever. He has a past history of PLHIV and is on ART for 2 years. Risk habit: Homosexual and IVDU



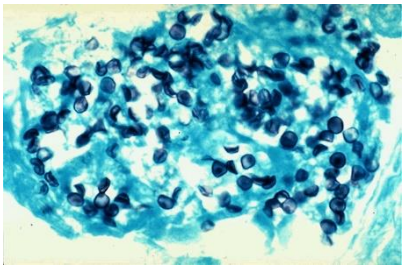
Sputum microscopy:

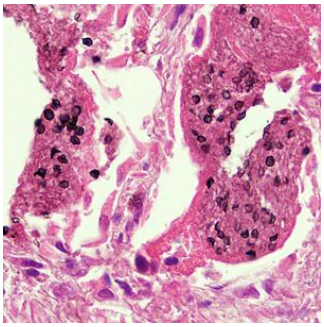
- Gram Stain: non-significant
- Acid fast: non-significant

Sputum culture:

- Bacterial: non-significant
- Fungal: non-significant

CXR: Reticular opacities B/L (Multiple, perihilar streaky opacities) with a pneumatocele. Lymphadenopathy and pleural effusion are not seen.





CT Chest: Similar findings with ground glass opacities.

BAL specimen GMS Staining: Broken pingball appearance

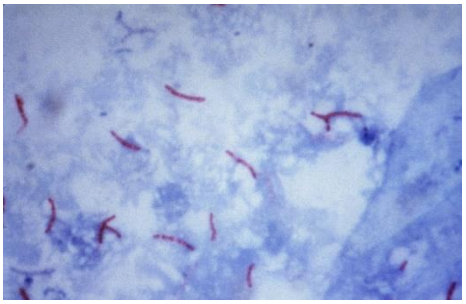
Lung Specimen: Multiple cysts around alveoli, honeycomb appearance

S. LDH – 300U/L , CD4 Count- 180

Dx: Pneumcystis Jiroveci pneumonia.

Mx: **Prophylactic therapy** – CD4 count drops below 200 cells/mcL
Preferred regimen: **TRIMETHOPRIM-SULFAMETHOXAZOLE,** 15 mg/kg/day (based on trimethoprim component) intravenously or one **double strength tablet** orally three times a day for 21 days. **ADD PREDNISONE** 40 mg orally twice a day on days 1–5, 40 mg orally daily on days 6–10, 20 mg orally daily on days 11–21. OR
Pentamidine, 3–4 mg/kg/day intravenously for 21 days plus **prednisone OR**
Primaquine, 30 mg/day orally, and **clindamycin**, 600 mg every 8 hours orally, for 21 days **plus prednisone** OR
Atovaquone OR **Dapsone**

Case 2: 12 year old female, with c/o cough with expectoration, Malaise, Hemoptysis- 2 episodes, night sweats. Family H/o 2 younger sisters



Sputum microscopy:

- Gram Stain: non-significant
- Acid fast: +++

XRAY: B/L Upper lobe patches

CHEST CT: Right Upper Lobe Cavitatory lesion with fibrosis (s/o secondary TB) (cavity is absent in TB+HIV)

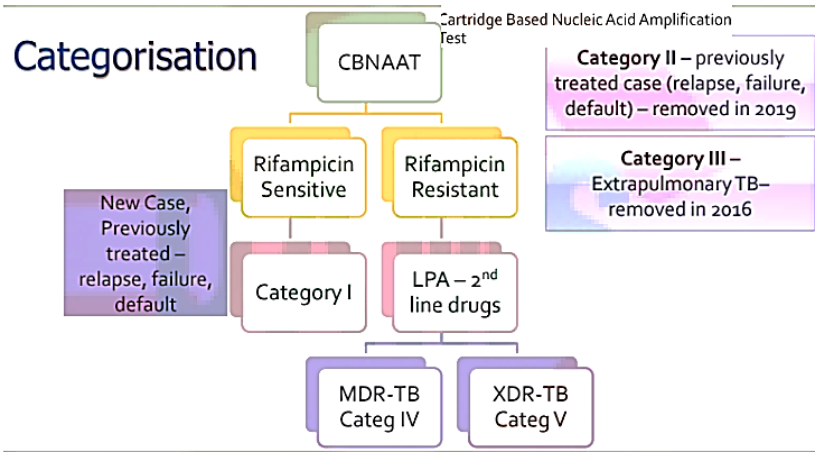
Sputum culture:

- AFG → MGIT: M.TB
- Resistant to INH + RIF

Dx: MDR-TB

- XDR TB is-
  - Should be MDR-TB
  - Resistant to available FQ
  - Resistant to one among the 2nd line agents
- CBNAAT: to detect the drug resistance, automated method based on RTPCR

Mx:


Categorisation
CBNAAT
Cartridge Based Nucleic Acid Amplification Test
Rifampicin Sensitive
Rifampicin Resistant
New Case, Previously treated – relapse, failure, default
Category I
LPA – 2nd line drugs
MDR-TB Categ IV
XDR-TB Categ V
Category II – previously treated case (relapse, failure, default) – removed in 2019
Category III – Extrapulmonary TB– removed in 2016

Drug Sensitive TB – Category I

Type of Patient	Intensive phase	Continuation Phase	Total duration
Cat I	2HRZE	4HRE	6
~~*Cat II*~~	~~2HRZES 1HRZE~~	5HRE	8

Intensive phase

- To rapidly kill bacilli & bring sputum conversion & symptomatic relief
- Sputum examination at end, if +ve, do drug sensitivity test

Continuation phase

- To eliminate remaining bacilli to prevent relapse & emergence of resistance
- May be extended for severe TB like CNS TB, skeletal TB, disseminated TB

Daily Dose of 1st Line ATDs

Drug	Daily dose (mg/kg)
INH (H)	5
Rifampicin (R)	10
Pyrazinamide (Z)	25
Ethambutol (E)	15

India TB Report 2019

Treatment of MDR-TB

- Total duration = **24-27 months**
- At least 4-6 drugs, based on drug sensitivity testing & past drug history
- Avoid combining drugs with cross resistance
- Minimum 6 months IP - extended by 1 month each time if sputum culture +ve at end of 4th, 5th, 6th month - for max 9 months

Resistant to both H & R

Standard RNTCP Regimen for MDR-TB

Intensive Phase (IP) 6-9 months	Continuation Phase (CP) 18 months
Kanamycin	Levofloxacin
Levofloxacin	Ethionamide
Ethionamide	Cycloserine
Cycloserine	Ethambutol
Pyrazinamide	
Ethambutol	

Treatment of DR-TB

INH Mono/ Poly Resistance

- LfxREZ x 6-9 months

Mono-drug Resistant TB

- R + 2 first-line sensitive drugs + 1 injectable + 1 FQ for IP – 3-6 months

Poly-drug Resistant TB

- R + 1 injectable + 1 FQ + 1 sensitive 1st line + 1 oral 2nd line for IP – 3-6 months

Treatment of XDR-TB

Resistant to H, R, FQ & one of Am/ Km/ Cm

- 9.7% MDR-TB estimated to be XDR-TB
- Exact incidence unknown as course is rapid & mortality is high
- Standard MDR regimen must be stopped till sensitivity results are available
- Individually tailored regimen from Gp V
- Total duration = **24-30 months**

	Intensive Phase (6-12 months)	Continuation Phase (18 months)
regimen	hdINH, hdMfx, Cm, PAS, Cfz, Lzd, Amx/clav	hdINH, hdMfx, PAS, Cfz, Lzd, Amx/clav

Capreomycin
Moxifloxacin
High dose INH
PAS
Clofazimine
Linezolid
Amox-clav

BEDAQUILINE

MOA — INHIBITS MYCOBACTERIAL ATP SYNTHASE

Kinetic — FOOD INCREASES ABSORPTION

ADR — GI toxicity, hyperuricemia Hepatotoxic, QT prolongation

CROSS RESISTANCE — WITH CLOFAZIMINE

Delamanid Pretomanid — INHIBITS MYCOLIC ACID SYNTHESIS

TEDUZOLID SUTIZOLID — Inhibits protein synthesis

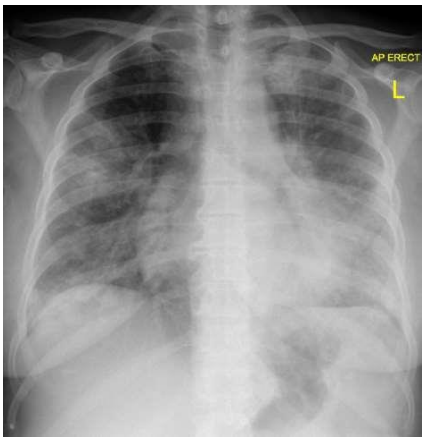
Case 3: A young man developed headache, shivering, muscle pains followed by vague abdominal symptoms and later a distressing cough. No respiratory distress was evident on initial examination and there were signs of clinical examination of the chest. He is working in a garden center operating the sprinkler system. He deteriorated rapidly requiring ICU care.

Sputum microscopy:

- Gram Stain: non-significant
- Acid fast: non-significant

Sputum culture:

- Bacterial: non-significant
- Fungal: non-significant



CXR: B/L middle and lower lobe consolidation

CT SCAN: B/L consolidation with presence of air bronchogram

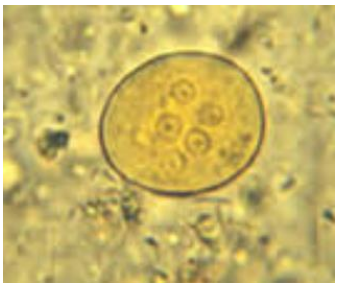
- Probable Dx: Legionella (Occupation of aerosolized water system) causing atypical pneumonia or walking pneumonia
- Dx: Dieterle stain in sputum specimen, DFAT from sputum/urine
- Prevention: Chlorinated water use
- Mx: 1st Line: Macrolides (Azithromycin) , 2nd line: FQ- Cipro/Levo

Special situations:

- Alcoholics: Anaerobes
- Aspiration: Anaerobes, Klebsiella
- Postviral: Staph. Aureus
- Neonate: GBS, E Coli
- Cystic Fibrosis: Staph aureus, Pseudomonas aeruginosa

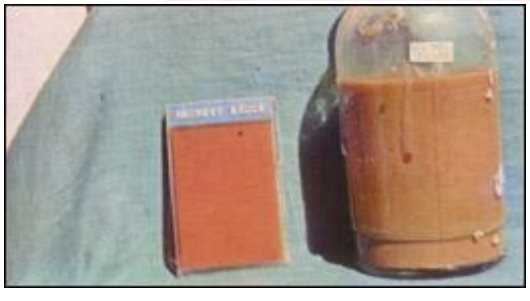
Case 4: A 40-year old female visited a rural village and soon after develops abdominal cramps, fever, and frequent watery diarrhea (>8 episodes/day) with blood and mucus for >2 weeks.

Stool microscopy: Small structure with multiple ingested RBC with ameboid movement

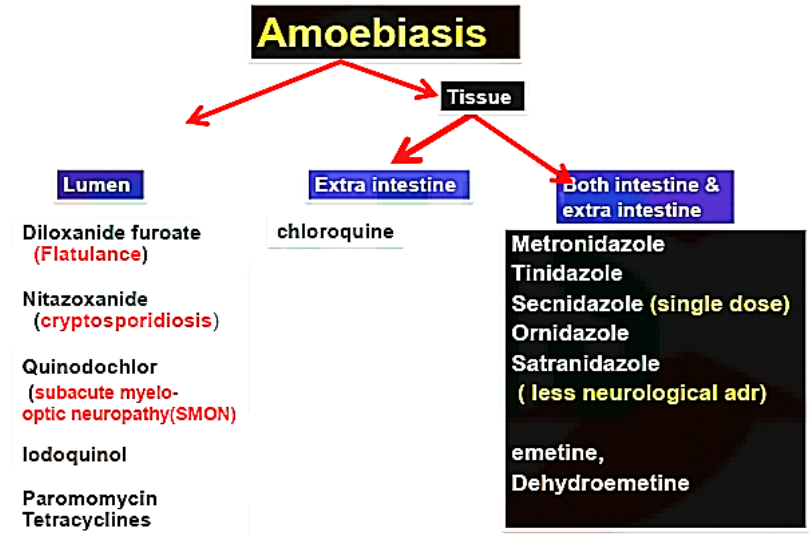


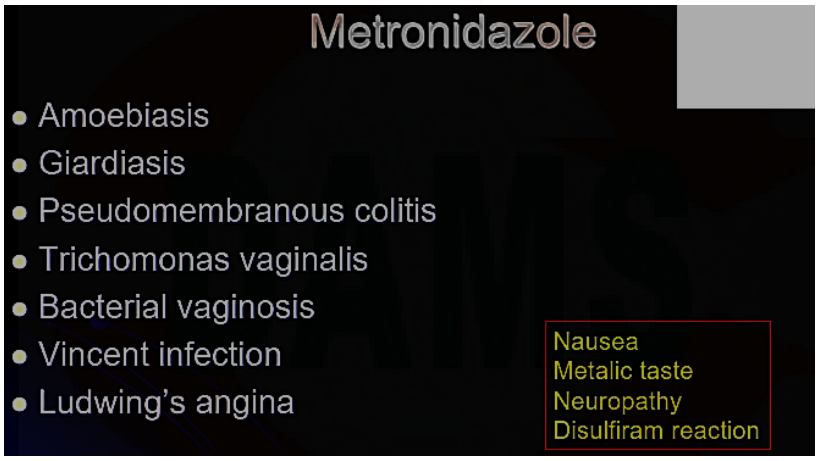
Intestinal Biopsy: Flask Shaped ulcer

- Dx: Entamoeba Histolytica (amebiasis)
- Extraintestinal manifestation: Amoebic Liver Abscess, Brain ameboma, skin manifestations
- Pus: Anchovy Sauce pus
- Only Trophozoite can be visualised, no cysts.



- Mx:





Guinea worm – NIRIDAZOLE DOC-

Case 5: A 34 year old man admitted with sudden onset nausea, vomiting, and copious amounts of watery diarrhea. He has sunken eyes, decreased skin turgor, and dry mucus membranes.

Stool Examination- Rice Water stools

Stool Microscopy- comma shaped organisms with darting/shooting start motility

Dx: Vibrio Cholera

- Selective Media: TCBS Agar
- Transport media: Venkatraman Ramakrishnan media
- Confirmatory field test: Motility inhibition test (MIT) by specific anti-serum
- Mx:

Vibrio cholerae

Rehydration
ORAL/ IV FLUIDS (RINGER LACTATE)

ANTI MICROBIAL THERAPY-

tetracycline, ampicillin, chloramphenicol, trimethoprim-sulfamethoxazole, fluoroquinolones, and azithromycin

Single 1 g oral dose of AZITHROMYCIN is effective for severe cholera

Case 6: a 28 year old man presented with vomiting & diarrhea. He reports that he recently went on a 3-day cruise to the Andaman islands. Two days after returning home, he started feeling nauseaous and has had 3 episodes of non bloody, non bilious vomiting and watery diarrhea. O/E his mucous membranes are dry and abdomen is soft and nontender to palpation.

Workup: Stool microscopy/culture- no bacteria/parasite isolated, no leukocytes, no occult blood.

Clue: Winter Vomiting bug → IgM ELISA for Norwalk Virus or RT-PCR

Mx:

No specific medicine

CORRECTION OF DEHYDRATION

Gastroenteritis in food poisoning:

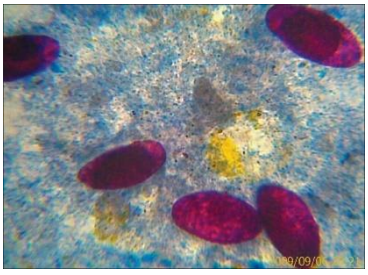
- Green Salads- S. aureus
- Hamburgers – EHEC
- Chinese Fried Rice- B. cereus
- Reheated Rice – C. Perfringens
- Shell Fish- V. Parahemolyticus
- Canned Food- C. botulinum

Case 7: A 32-year old PLHIV develops watery, non bloody diarrhea w/o fever

Stool Microscopy and AFS:

Dx: Cystisospora belli

Mx:- COTRIMOXAZOLE



Case 8: A 33 year old man with no past history presents for screening for hepatitis B. The patient states that he is in good health and denies any symptoms. His vitals and examination are unremarkable.

Serology: HBsAg + , Anti HBsAg Ab negative, Anti HBcAg IgM negative, Anti HBcAg IgG +,

HBeAg negative, Anti-HBeAg Antibody is positive

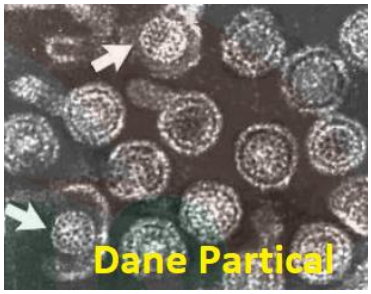


TABLE 332-6 Simplified Diagnostic Approach in Patients Presenting with Acute Hepatitis

SEROLOGIC TESTS OF PATIENT'S SERUM				
HBsAg	IgM ANTI-HAV	IgM ANTI-HBc	ANTI-HCV	DIAGNOSTIC INTERPRETATION
+	–	+	–	Acute hepatitis B
+	–	–	–	Chronic hepatitis B
+	+	–	–	Acute hepatitis A superimposed on chronic hepatitis B
+	+	+	–	Acute hepatitis A and B
–	+	–	–	Acute hepatitis A
–	+	+	–	Acute hepatitis A and B (HBsAg below detection threshold)
–	–	+	–	Acute hepatitis B (HBsAg below detection threshold)
–	–	–	+	Acute hepatitis C

Management:

Chronic hepatitis B	Oral agents
IFN-α, PEG IFN-α	**First-line:** Entecavir, Tenofovir **Second-line:** lamivudine, Adefovir, Telbivudine

Chronic hepatitis C	
PEG IFN-α plus ribavirin	Telaprevir Boceprevir Simeprevir Daclatasvir Velpatasvir Ombitasvir **Sofosbuvir (oral, renal, bradycardia)** **Ledipasvir** **Viramidine (under trail)**

Case 9: Stool microscopy shows a pear shaped organism with falling leaf motility.

Dx: Giardia intestinalis

Causes Vitamin B12 associated Anemia, Traveller's Diarrhea.

Mx: Metronidazole

Case 10: Diarrheal Pathogen. Non Lactose fermenting colonies seen on MacConkey Sorbitol Agar.

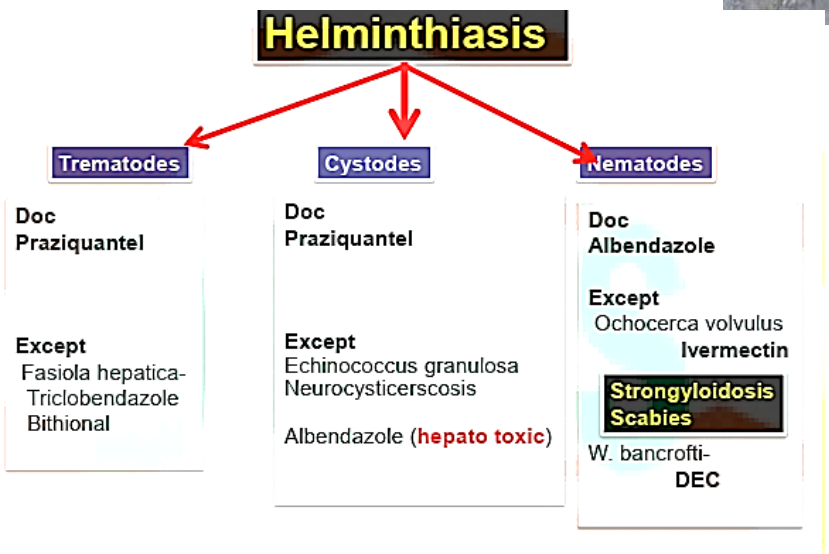
DX: ETEC (Shiga Toxin, Vera Toxin); also cause HUS

MoA: acts on 28S ribosomal subunit (60S unit) and inhibit protein synthesis

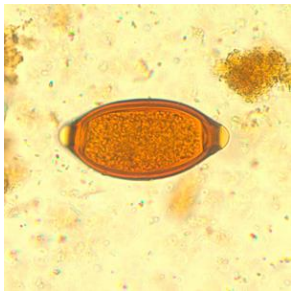
Mx: No role of antibiotics since toxin-mediated. Rather antibiotics are contraindicated.

Case 11: Strongyloides stercoralis pathogen causing different auto-infections.

Mx:



Case 12: Identify the diarrheal pathogen



Dx: Trichuris trichura infection.

Complications: Rectal prolapse (Coconut cake rectum), IDA

Mx: Albendazole

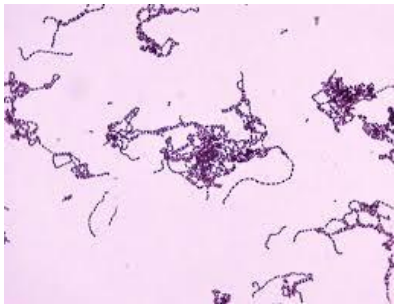
Case 13: A 53 year old female presents with diarrhea and abdominal cramping for the past 2 days. She reports having a subjective fever with nausea and frequent diarrhea that is occasionally bloody. She recalled returning from a hiking trip. Identify the pathogen.

Dx: Campylobacter jejuni showing darting motility, gullwing appearance, microaerophilic and zoonotic disease.

Complication: Ascending Paralysis (GBS)

Mx: Manage dehydration, Antibiotic- Azithromycin

Case 14: 7 year old child with a sore throat is tired and has fever and headache. Pus filled vesicles on her face. Swollen LN are present.



Gram Stain shows Gram positive cocci arranged in stains. Bacitracin sensitive.

Dx: Group A Beta Hemolytic Streptococcus (S. pyogenes)

Rash: Sand-paper rash
C/F Strawberry Tongue

Selective Media: PNF Media, CV Blood agar

Mx: Beta lactams, cephalosporins

Uncomplicated PNEUMOCOCCAL PNEUMONIA, single-lobe disease without signs of extrapulmonary infection) caused by penicillin-susceptible strains of pneumococcus

AMOXICILLIN, 750 mg orally twice daily for 7–10 days. Cephalosporins including CEFPODOXIME, 200 mg orally twice daily, and CEFDINIR, 300 mg twice daily

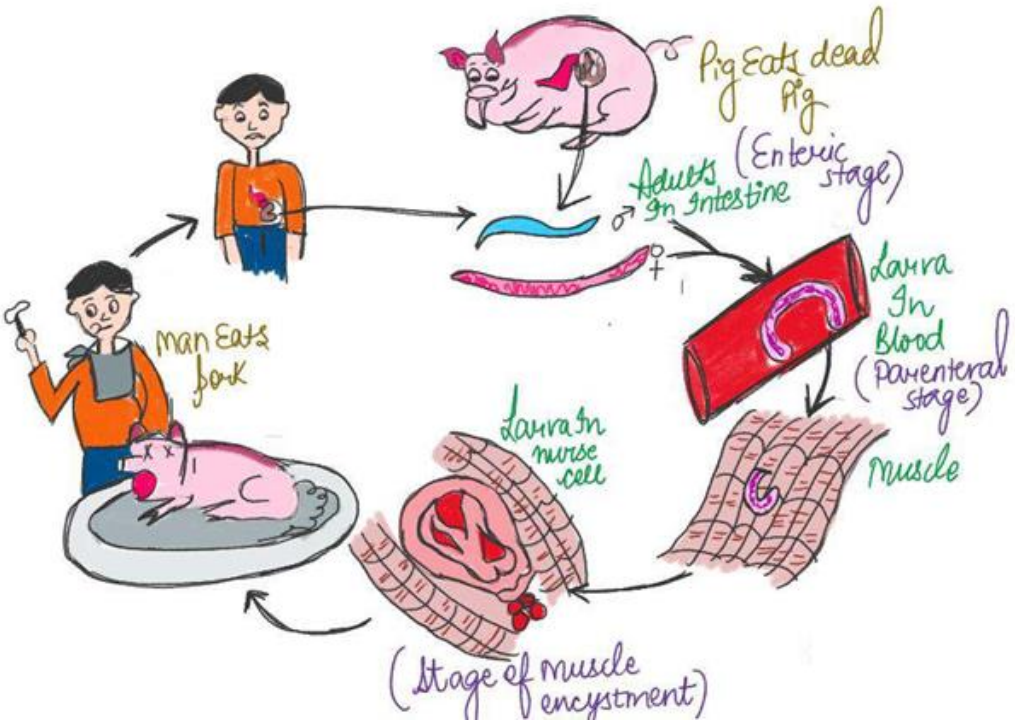
FOR PENICILLIN-ALLERGIC PATIENTS
azithromycin,
Clarithromycin
Doxycycline
levofloxacin
moxifloxacin

penicillin-resistant strain-
Vancomycin
levofloxacin

PART 2

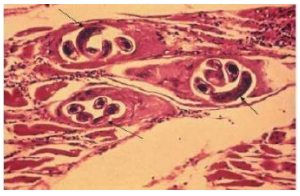
Case 1: Within 2 weeks of eating bear meat in Uttarakhand, a man develops intense vomiting and diarrhoea, followed shortly by a fever of 103°F, throbbing headache and achy muscles. After a few more days of these unrelenting symptoms, he seeks medical attention. His white blood cell count at presentation is 16,100/mm3, with 22% eosinophils. Creatine kinase level in serum was elevated. What is the diagnosis?

Ans. **TRICHINELLA SPIRALIS INFECTION**



Important points:

- PIG: Optimum Host & Principal reservoir
- Other Hosts: Rat, Bear, Horses
- Infective: L1
- Lab Dx:
    - Larval +nt in muscle biopsy



    - Antibody: ELISA, CIEP
    - Bachman test
    - Animal Inoculation (in rats)
    - Leucocytosis, Eosinophilia, Increase Creatine Phosphokinase
- Mx: Mebendazole, Albendazole

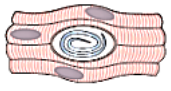
TRICHINELLOSIS

Bed rest

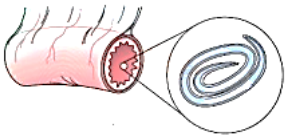
Antipyretics

Analgesics

Prednisone- severe myositis and myocarditis

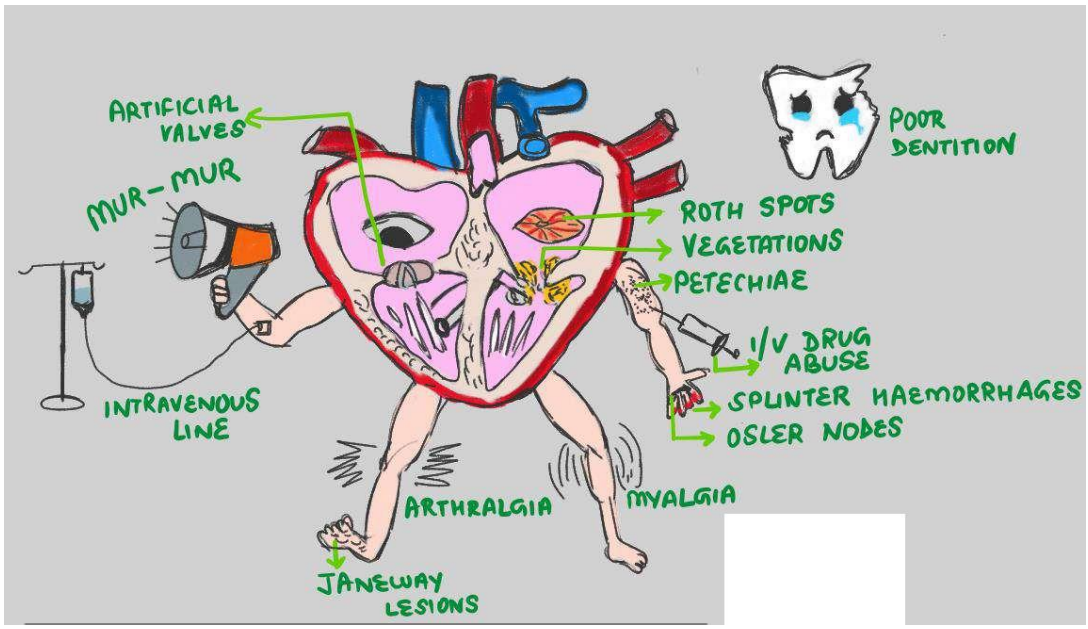


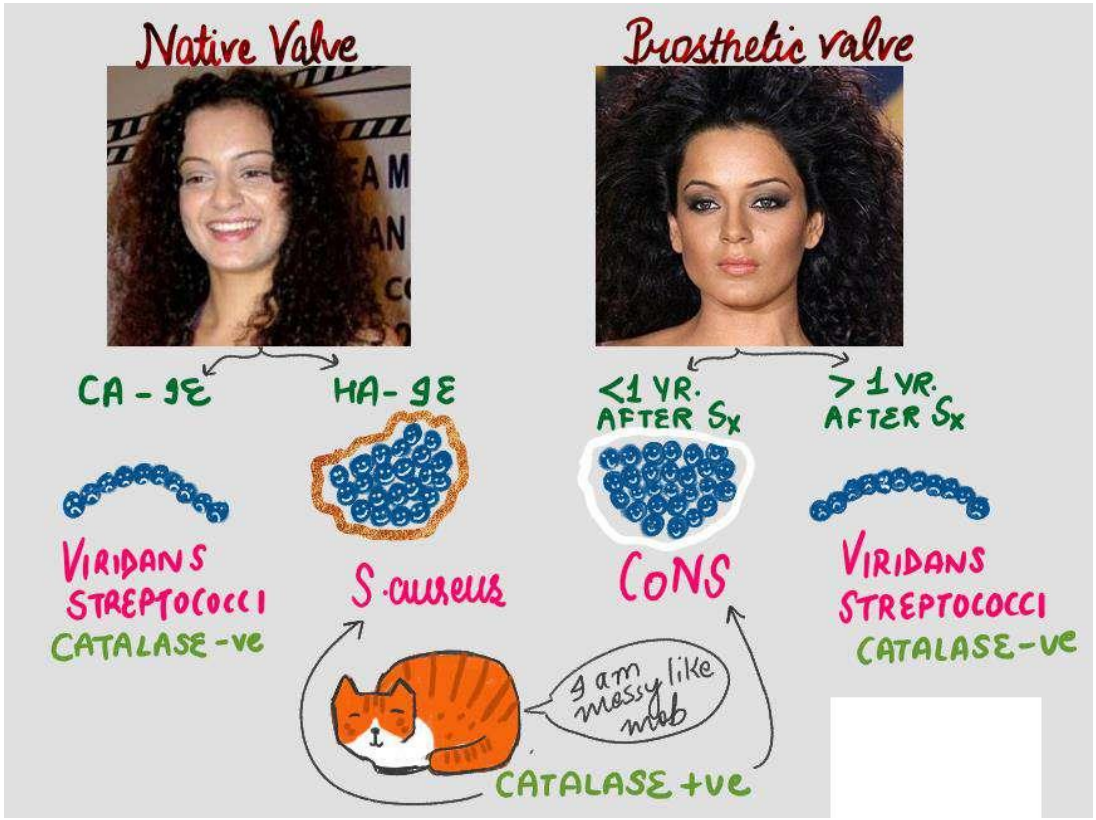
Mebendazole and albendazole are active against enteric stages of the parasite,

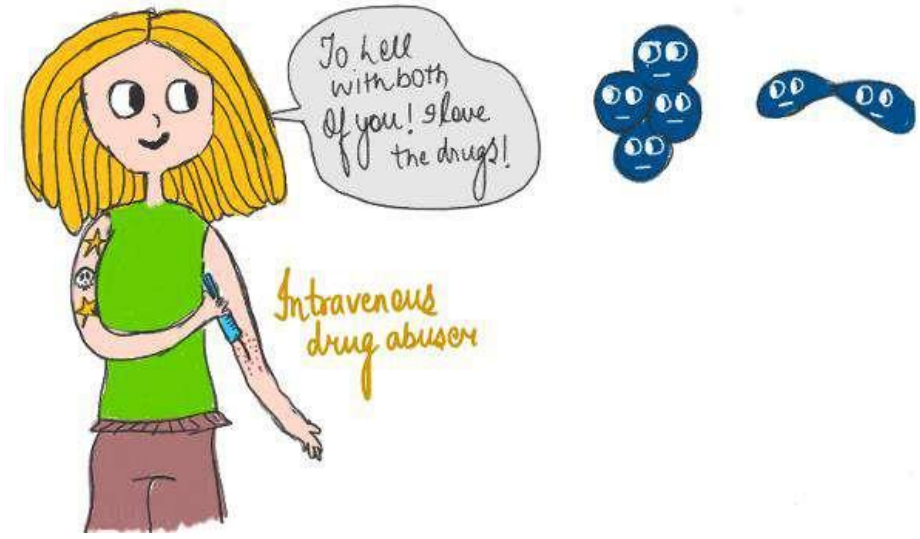


Case 2: A 67-year-old man developed an insidious onset of fever, chills, and night sweats. Over the course of a week or so he became increasingly weak and short of breath. A heart murmur was heard on auscultation. Blood tests revealed an elevated erythrocyte sedimentation rate. Valvular vegetations were seen on transoesophageal echocardiography. What is the diagnosis?

Ans. **Subacute endocarditis by Viridans Streptococci**

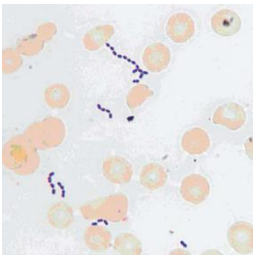






Important points:

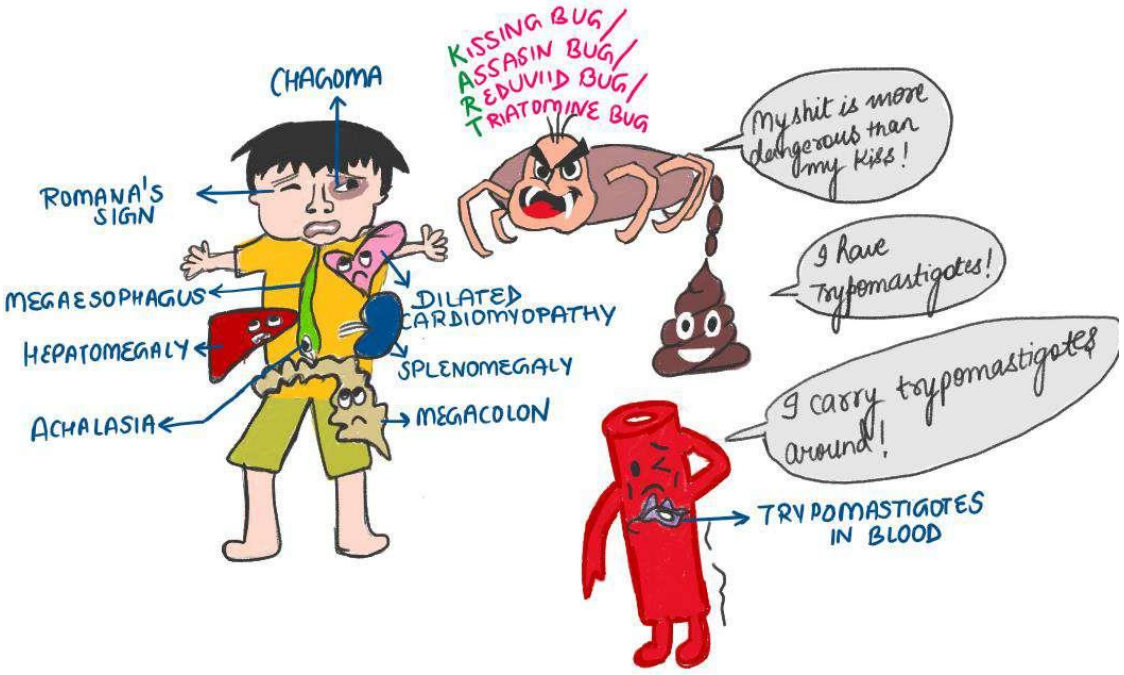
- Gram stain of cultured blood from a patient with enterococcal bacteraemia
- Mx: Penicillin

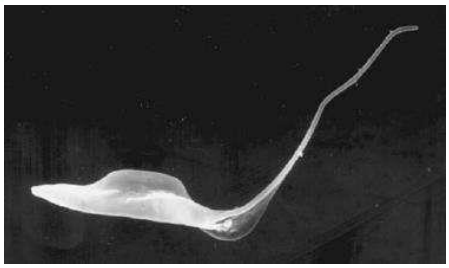


Case 3: A 65-year-old man, a South American immigrant, presents with biventricular heart failure with peripheral oedema, hepatosplenomegaly, and pulmonary congestion. Global heart enlargement is seen on chest radiography. Electrocardiography reveals right bundle- branch block and left anterior fascicular block. Serum collected from the patient and run on ELISA detects antibodies to an agent transmitted by the bite of reduviid bugs. What is the aetiology of this man's disease?

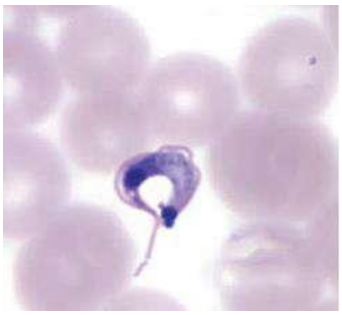
Ans. **Trypanosoma cruzi infection**

Romana's sign

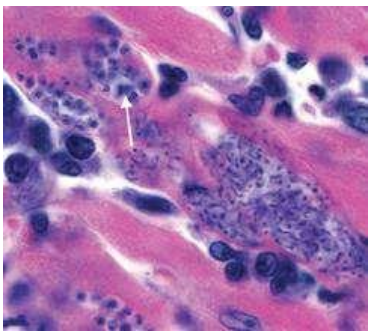




Scanning electron micrograph of a trypomastigote of T. cruzi

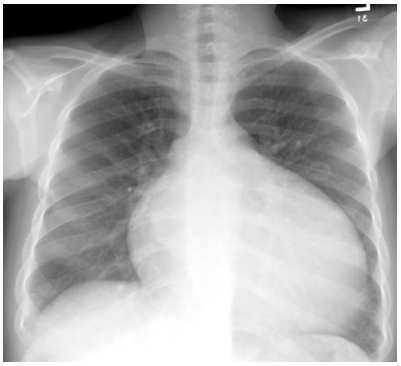


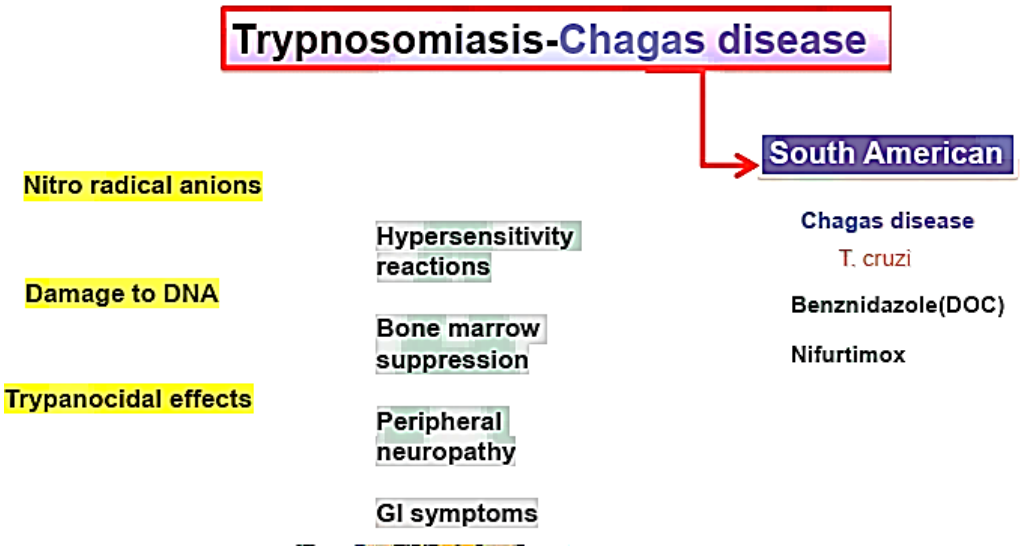
TRYPOMASTIGOTES (GIEMSA-STAINED THIN BLOOD SMEAR)



AMASTIGOTES IN HEART TISSUE (H & E STAIN)

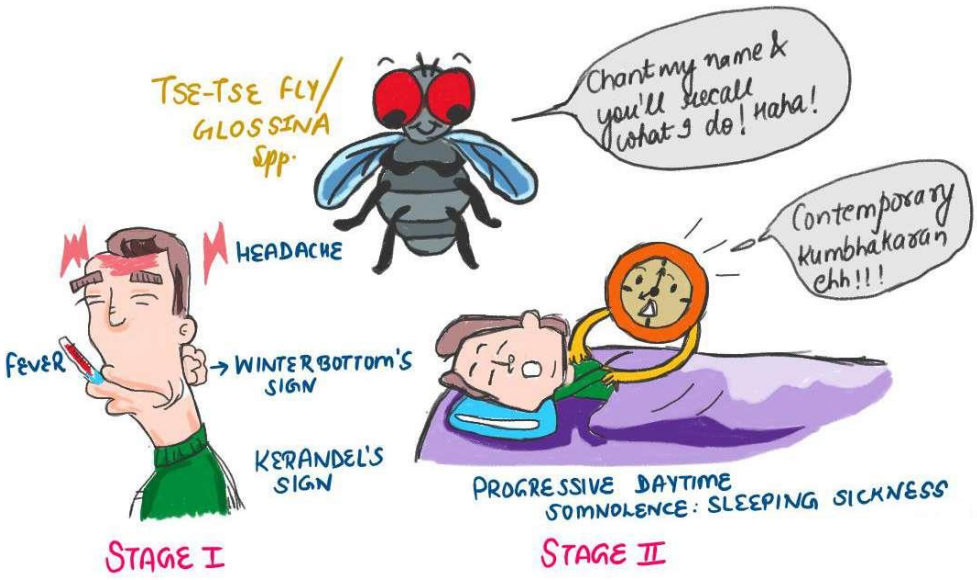
Mx: NIFURTIMOX, BENZNIDAZOLE

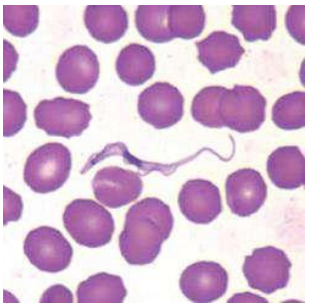




Case 4**:** A wildlife photographer travels to a big game park in East Africa and returns home with intermittent fever and a painless chancre like sore on his neck. A Giemsa-stained blood smear is positive for a flagellated microbe (shown in the image). What is the diagnosis?

Ans. Sleeping Sickness





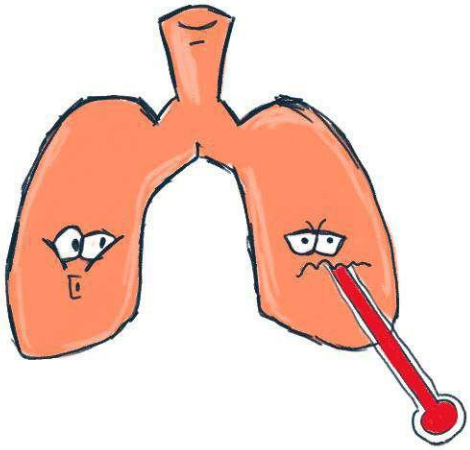
Lab Dx:

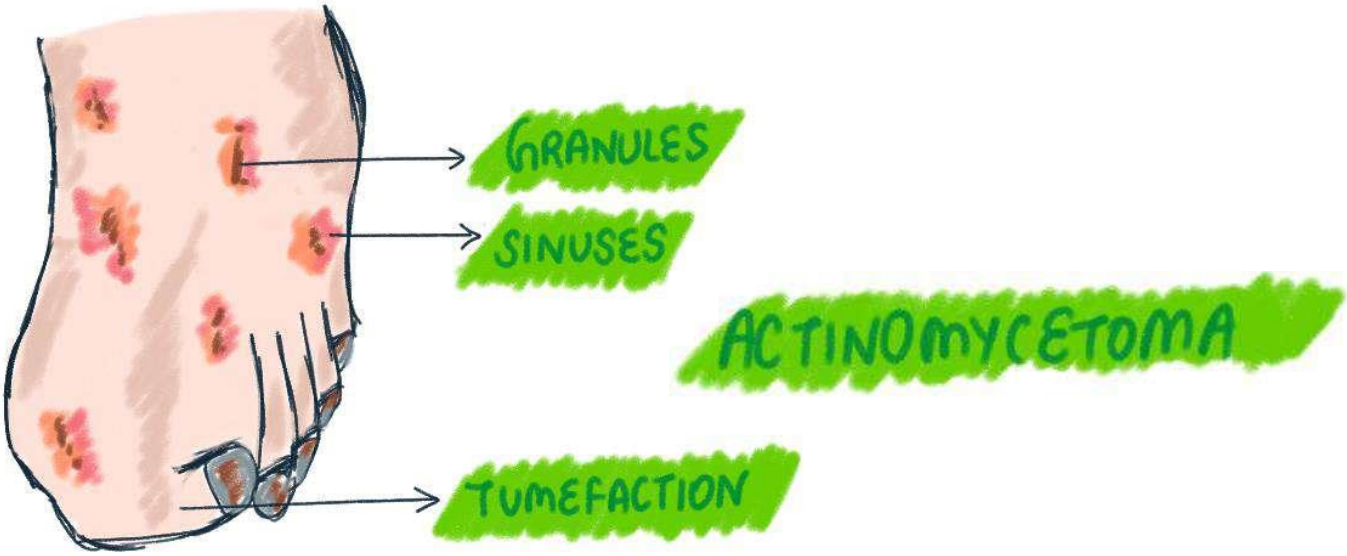
DIRECT MICROSCOPY TO SEE TRYPOMASTIGOTES IN BLOOD, CSF, L·N ASPIRATES
ANTIBODY IN SERUM, CSF BY ELISA, IIF, CARD AGGLUTINATION TEST
ANTIGEN IN SERUM, CSF BY ELISA
PCR
CULTURE IN KIVI

Rx: Early: Pentamidine, Surmin ; Late stage: Eflornithine, Melarsopol

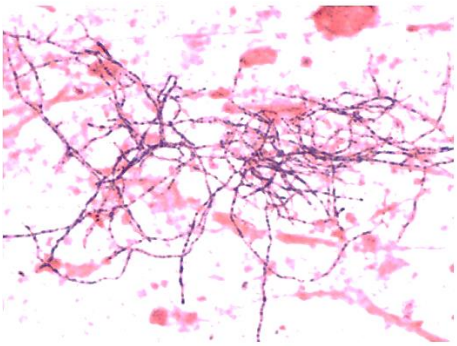
T.gambience & T.rhodesiense
early- haemolymphatic stage
Suramin (DOC) **Pentamidine**
late- CNS stage
Malarsoprol(DOC) **Eflornithine**

Case 5: A 45-year-old woman complains that her right arm has become increasingly weak during the past few days. This morning, she had a generalized seizure. She recently finished a course of cancer chemotherapy. Magnetic resonance imaging (MRI) of the brain reveals a lesion resembling an abscess. Brain biopsy shows grampositive rods in long filaments. Organism is weakly acid-fast.

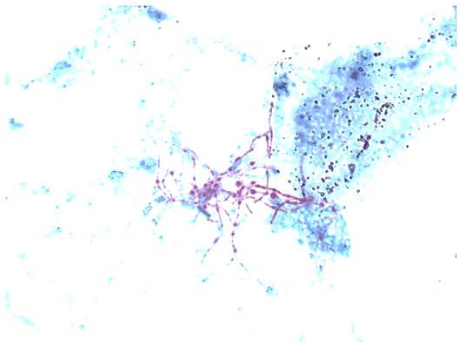


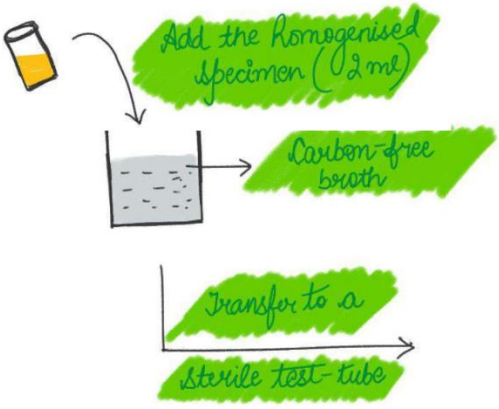


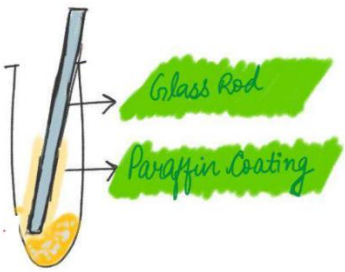
GRAM STAIN OF NOCARDIA

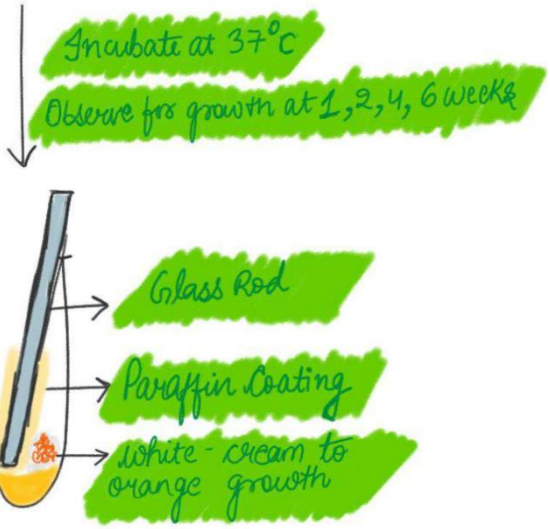


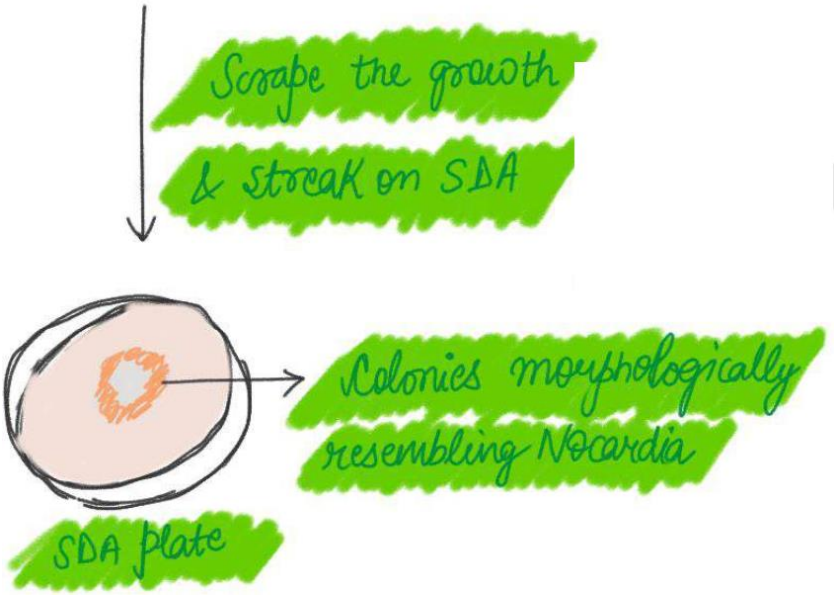
ACID FAST STAIN OF NOCARDIA

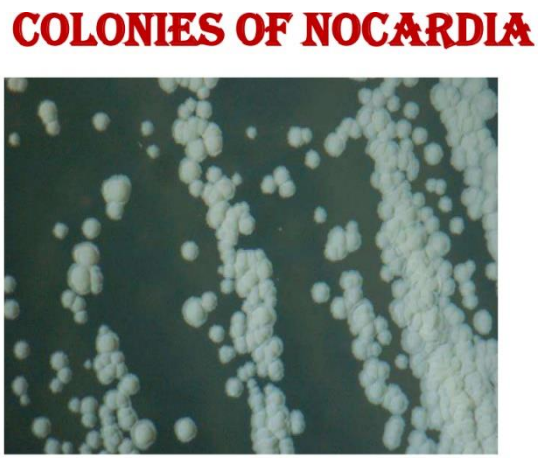






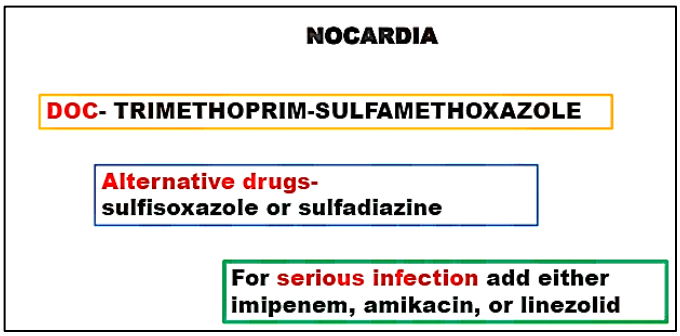


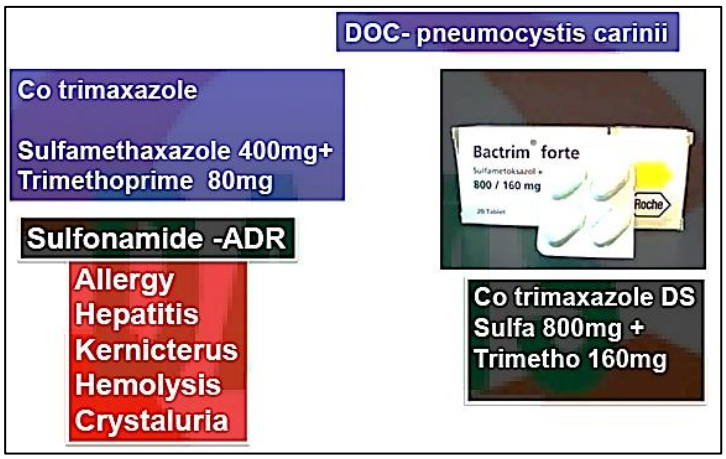


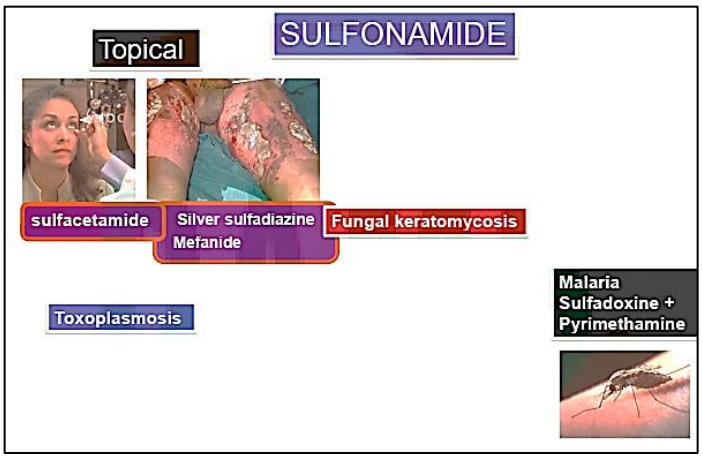


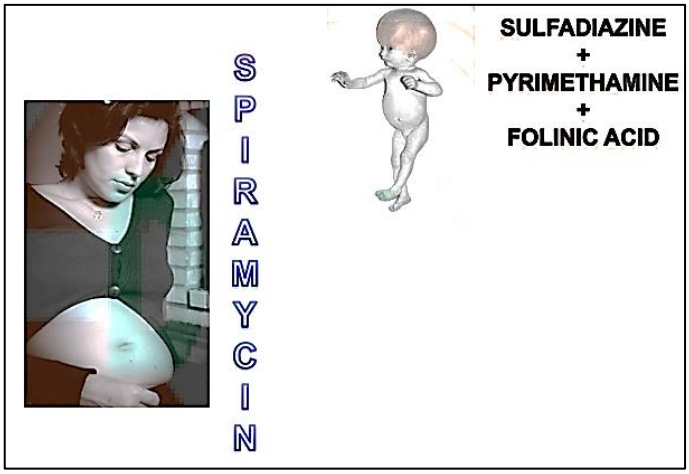
Rx: DOC for all forms- Sulfonamide or Cotrimoxazole

For brain abscess/Pneumonia: Cotrimoxazole/Imipenem



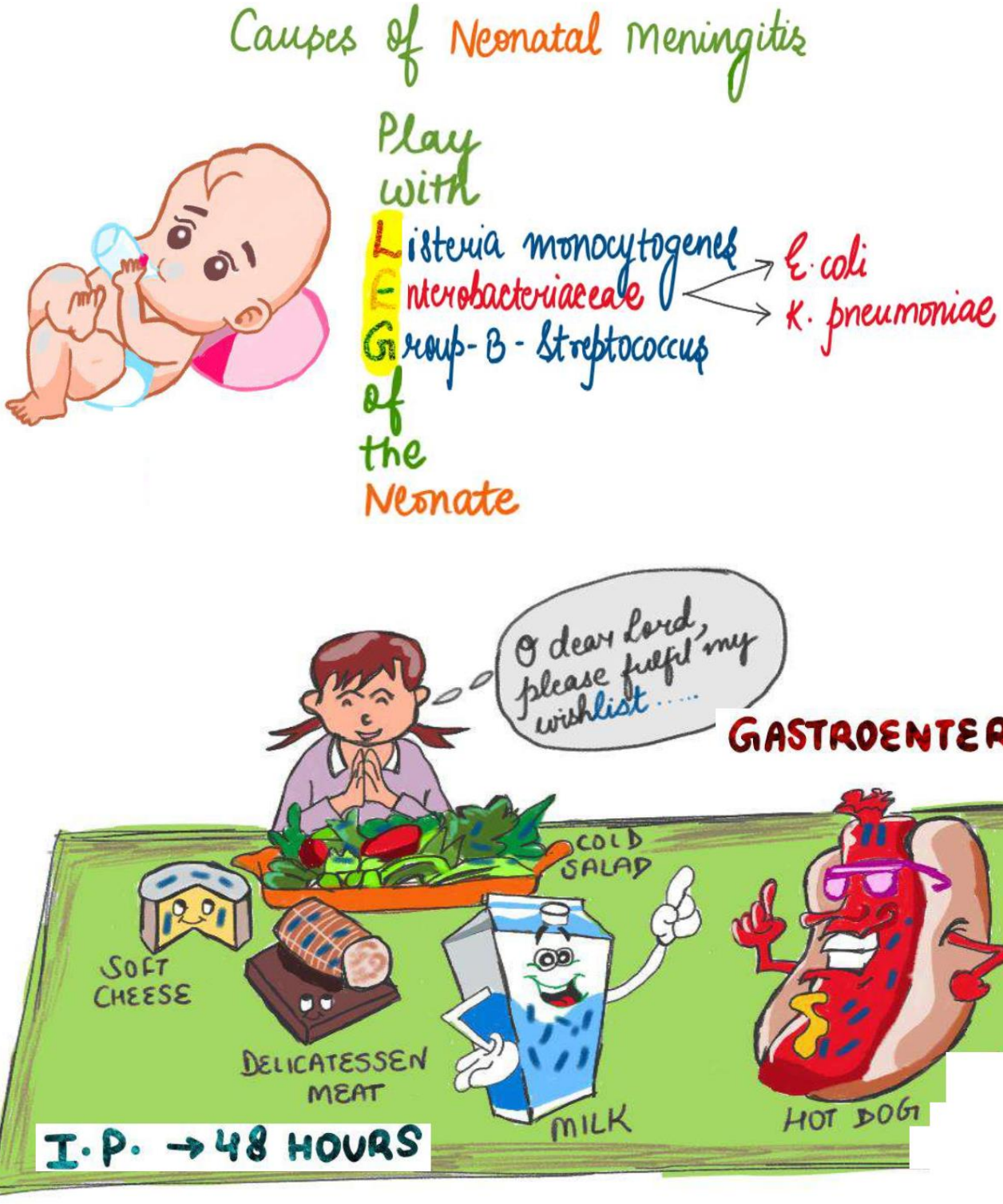




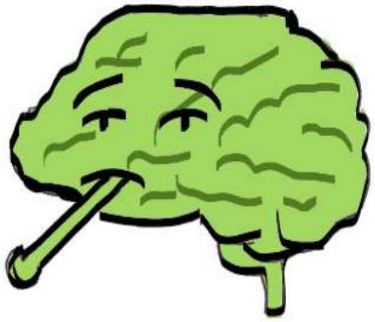


Case 6: A 34-year-old woman in her third trimester of pregnancy delivers a stillborn infant. Her history is significant for a febrile illness with headache, back pain, and diarrhoea prior to going into premature labour. A Gram-positive motile coccobacillus was isolated from blood of the mother and the infant cultured at 4 °C. How did the mother acquire this infection?

Ans. Intake of contaminated food



MENINGITIS



NEONATES (>5 DAYS OF BIRTH)

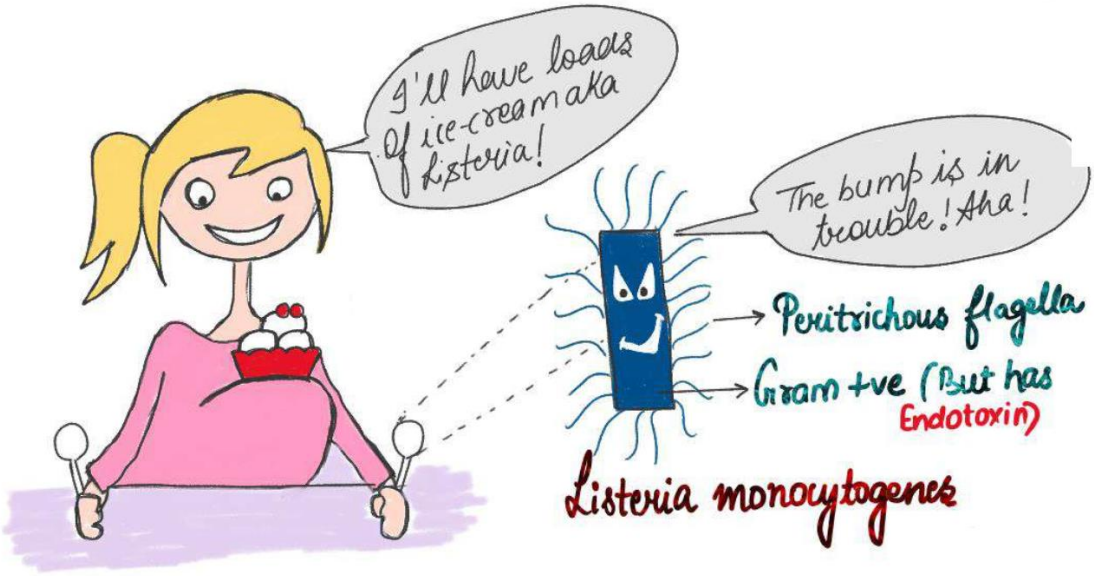
STEROIDS

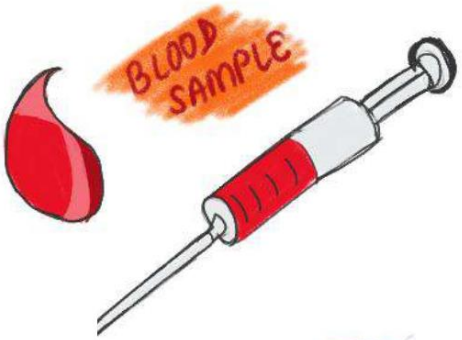
HIV ← ADULTS → DIABETES

MALIGNANCY

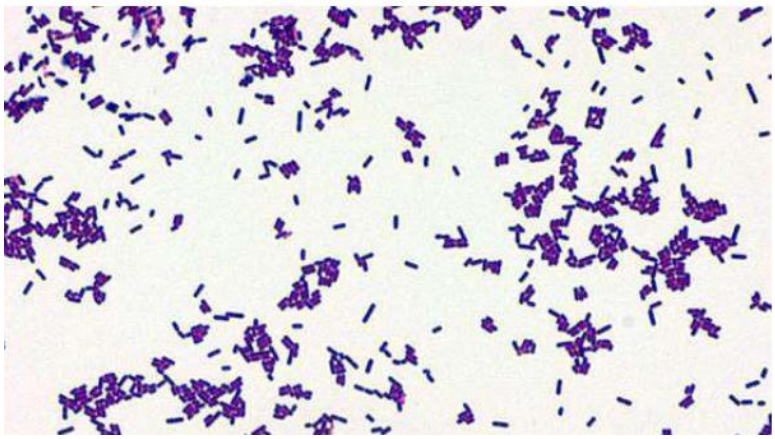
KIDNEY TRANSPLANT RECIPIENTS (AFTER 1 MONTH)

PREGNANCY


I'll have loads of ice-cream aka listeria!
The bump is in trouble! Aha!
Peritrichous flagella
Gram +ve (But has Endotoxin)
Listeria monocytogenes



GRAM STAIN



β-HEMOLYSIS ON BLOOD AGAR

SELECTIVE MEDIUM: PALCAM AGAR

CAMP TEST +ve

CATALASE +ve

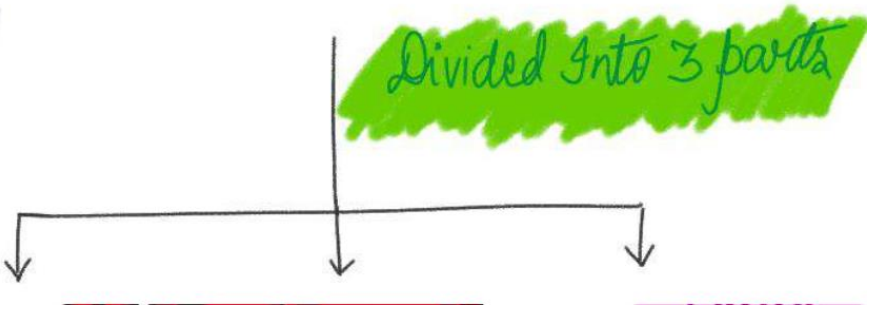
FACULTATIVE INTRACELLULAR

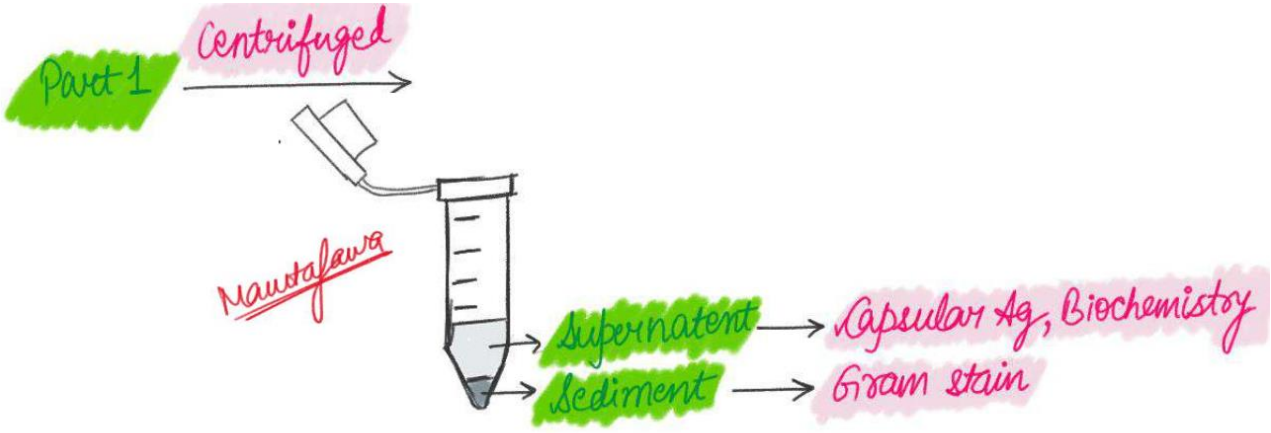
Rx: AMPICILLIN + GENTAMYCIN ; For penicillin allergic: TMP-SMX

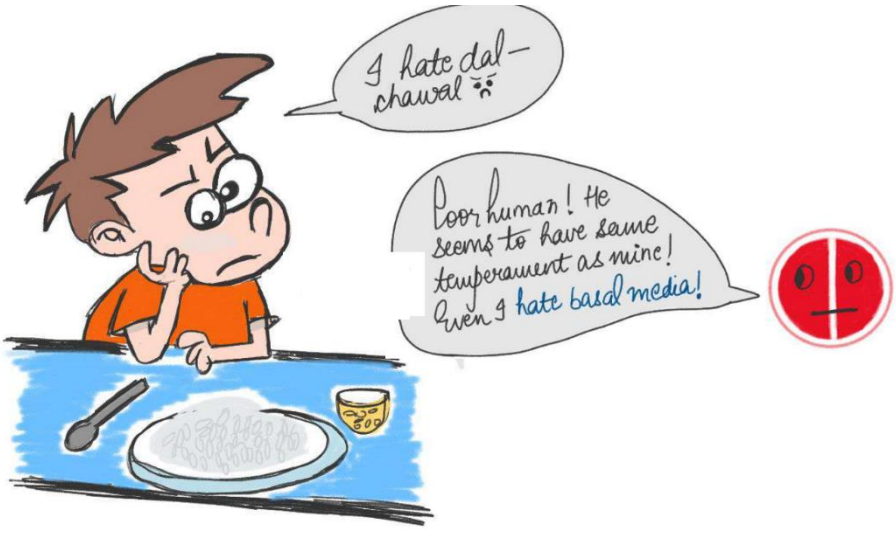
SJS- DOC: Thiocetazone

Case 7: A 14-year-old female medical student presented with a febrile headache, vomiting. Physical examination revealed a petechial rash on the skin. Gram stain of the CSF revealed the presence of Gram-negative diplococci and culture suggested a strict aerobe that fermented glucose and maltose. Capsule antigens were also detected by serology. Which is most likely the causative agent of the disease?

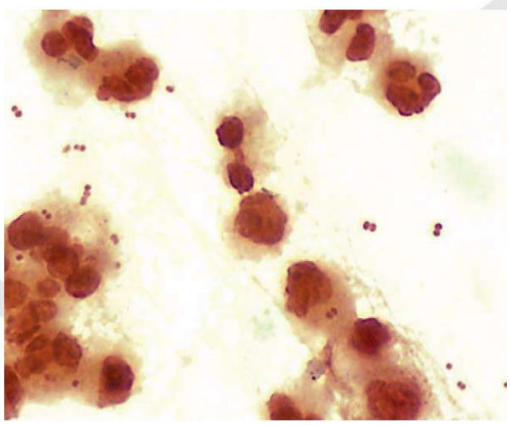
Ans. **Meningitis by Neisseria meningitidis**



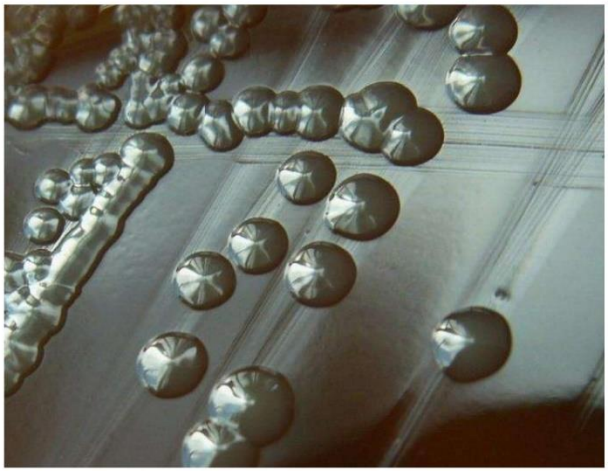




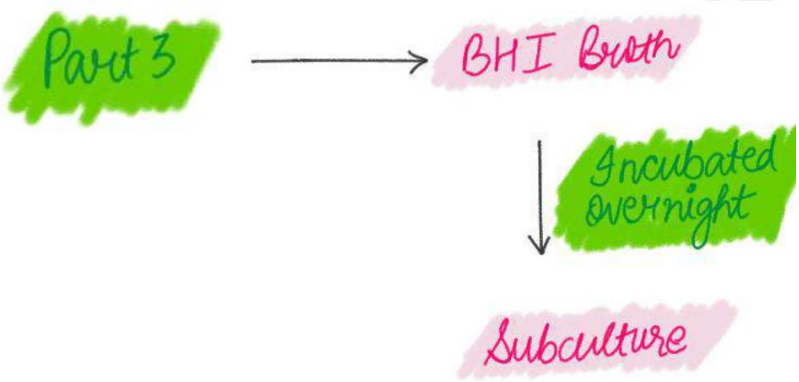
VEISSERIA MENINGITIDIS IN CEREBROSPINAL FLUID



COLONIES OF MENINGOCOCCUS ON CHOCOLATE AGAR



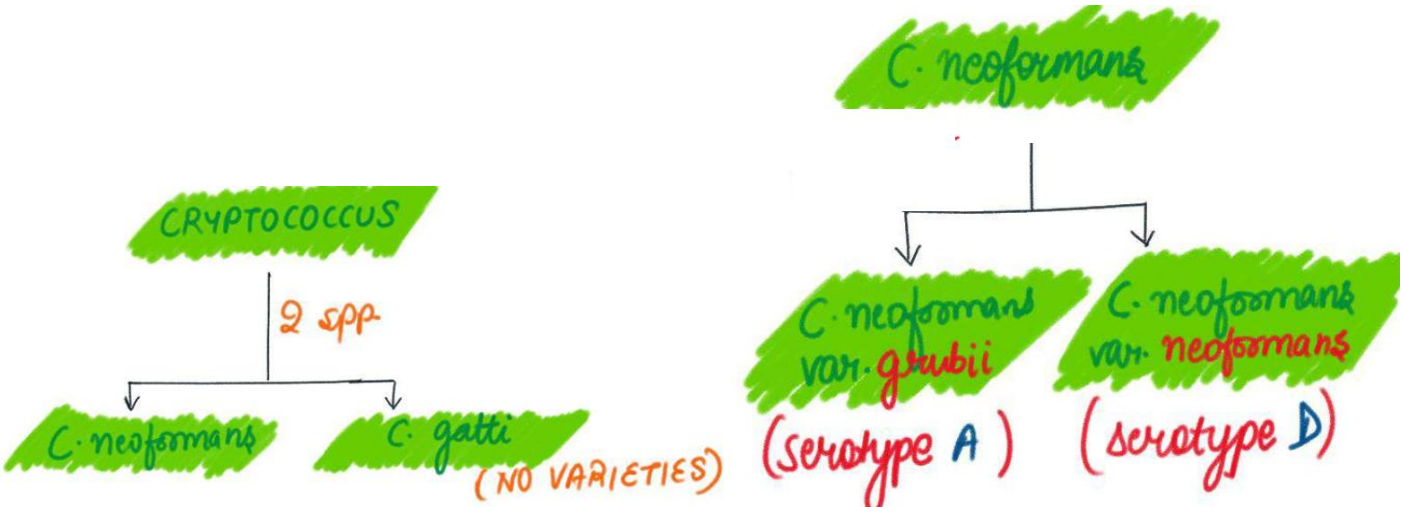
SKIN LESIONS IN A PATIENT WITH MENINGOCOCCAEMIA

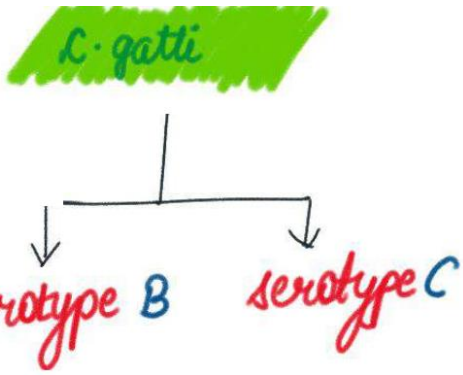


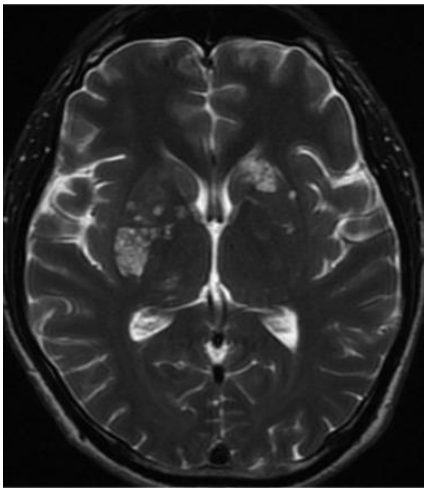
Rx: CEFTRIAXONE - DOC

Case 8: A 47-year-old AIDS patient with a CD4 cell count of 95/cmm presents with an insidious onset of severe headache and fever for the past 3 weeks. In the past few days, he had become mildly confused and developed diplopia. Papilledema is seen on physical exam. Dilated Virchow robin spaces are seen on MRI. Cerebral spinal fluid (CSF) showed 150 mononuclear cells/cmm, mild elevation of protein, and decreased glucose. An India ink stain of the CSF was negative; however, capsular polysaccharide antigens, found in the CSF, allowed for a definitive diagnosis. What is the aetiology of this man's infection?

Ans. **Crytococcal meningitis**

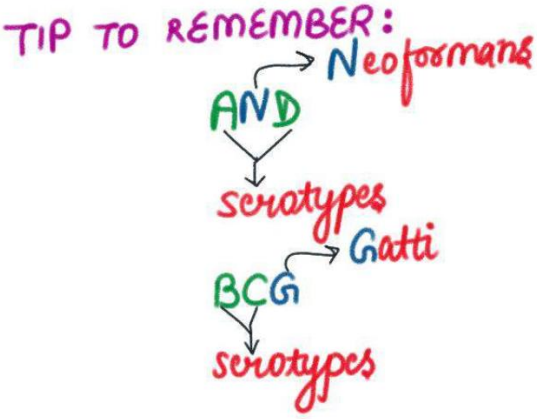


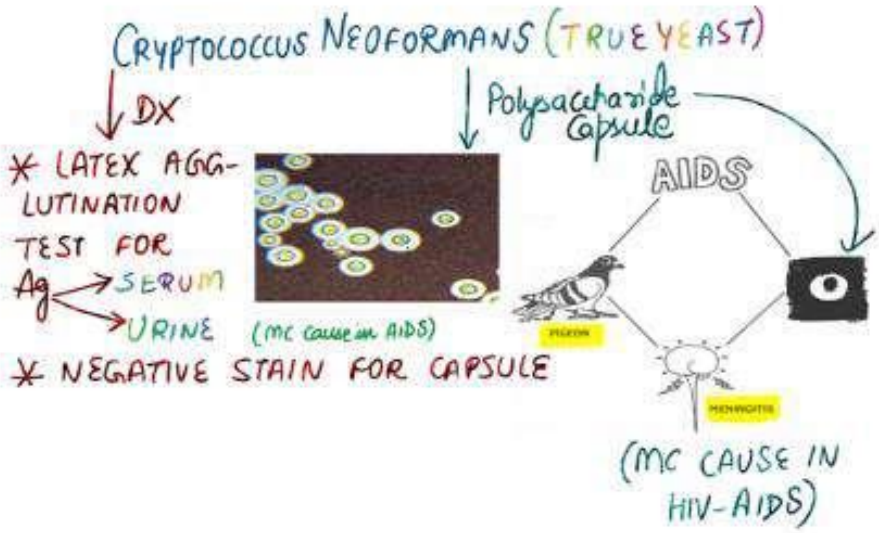


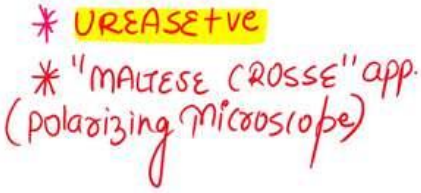


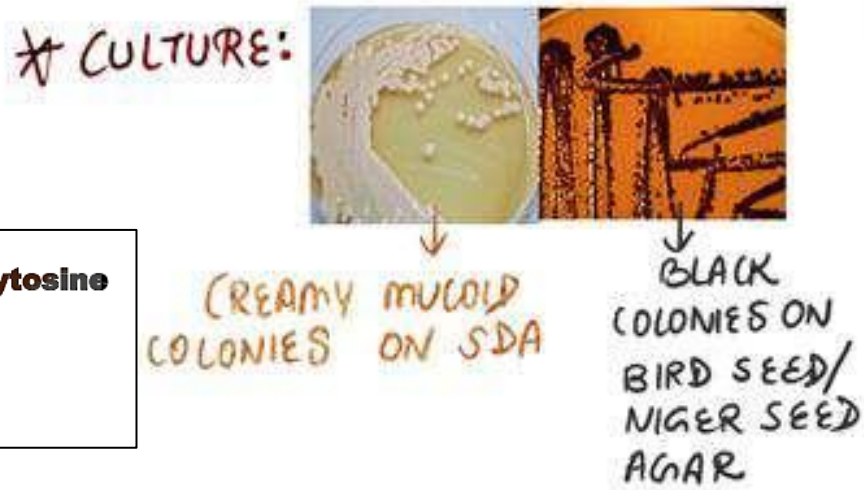
MRI Findings:

Dilated Virchow Robin Spaces with basal gelatinous exudates in the perivascular spaces.





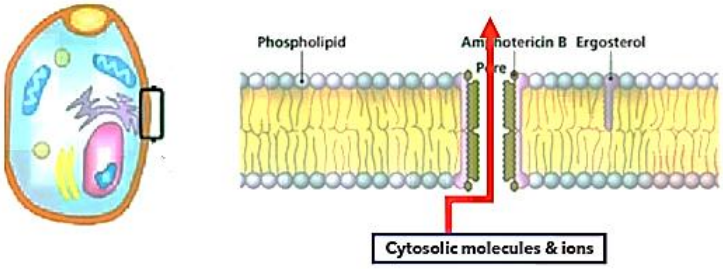




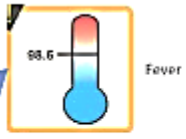
Cryptococcal meningitis
Induction- Amphotericin B + flucytosine

Maintenance-
Initially by i.v. fluconazole
Followed by oral

MOA



ADR



Infusion related reaction

Inj. Hydrocortisone
Oral paracetamol/ ibubrofen

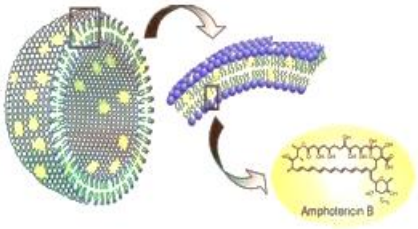
Azotemia-Nephrotoxity- dose limiting
Hypokalemia/ hypomagnesemia

Hydration (1L- normal saline)
Dextrose infusion

Anemia (decreased production of erythropoietin)

CNS toxicity (intra thecal)- seizure, neurological damage

Amphotericin B



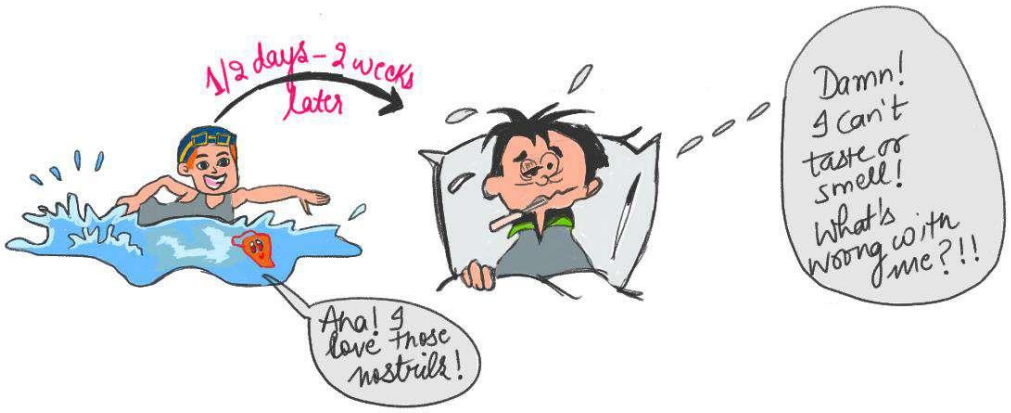
ABCD (colloid dispersion)

ABLC (lipid complex)

LIPOSOMAL AMB-

Case 9: In July, a previously healthy 12-year-old girl from Bihar, who enjoys swimming in farm ponds is evaluated for meningitis. Gram stain of the CSF demonstrates no bacteria or yeast; however, there are indications of a PMN leucocytosis. A wet mount shows motile cells that resemble WBCs. Intravenous ceftriaxone therapy is initiated, but within 24 hours she slips into a coma. CT shows brain swelling or oedema. Unfortunately, she is unresponsive to anticonvulsant drugs and dies the following day. Based on the available information, which diagnosis is the most plausible?

Ans. **Primary Amoebic Meningoencephalitis (PAM) by Naegleria fowleri**



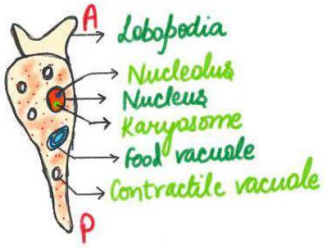
CSF SAMPLE

THICK, PURULENT
↑ PROTEIN
↓ SUGAR
PMN > 20,000/μl

ARGUS

You bet I am! I multitask! I infect, invade & multiply (Binary fission).

Are you the Amoeboid face of Naegleria fowleri??

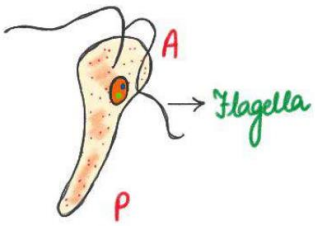


Naegleria

Bingo! I develop in distilled H_2O (27-37°C) from amoeboid form. I like jerks & spins!

ARGUS

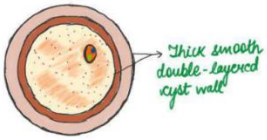
Are you the flagellated face of Naegleria fowleri??



Caught you! You are the cyst of Naegleria fowleri!

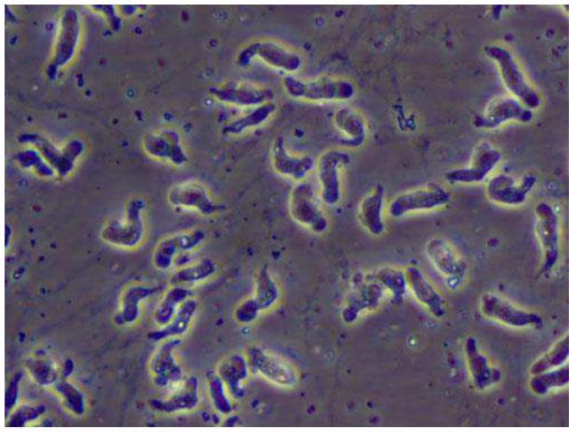
ARGUS

Yes buddy I am! I am thick-skinned you see yet well-cultured ·ᴗ·

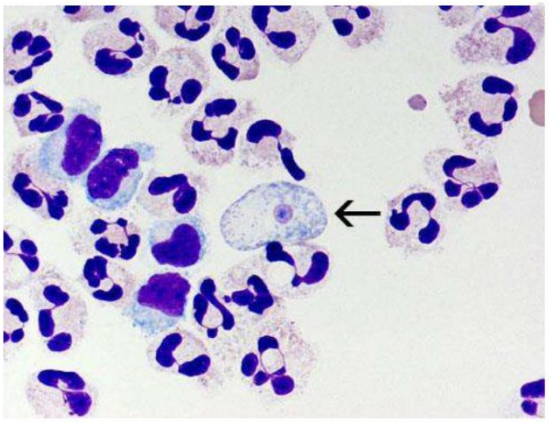


Lemme leave my trail behind!
Trail sign
Non-nutrient agar with lawn of E. coli
Scrapings transferred to Distilled H_2O
Flagellated form

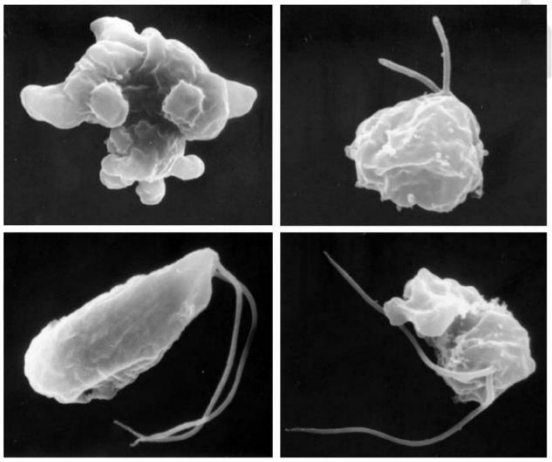
NAEGLERIA FOWLERI UNDER PHASE CONTRAST MICROSCOPE



GIEMSA-WRIGHT STAIN OF CSF



SCANNING ELECTRONIC MICROGRAPH (SEM) OF *N. FOWLERI*



RX: AMPHOTERICIN B

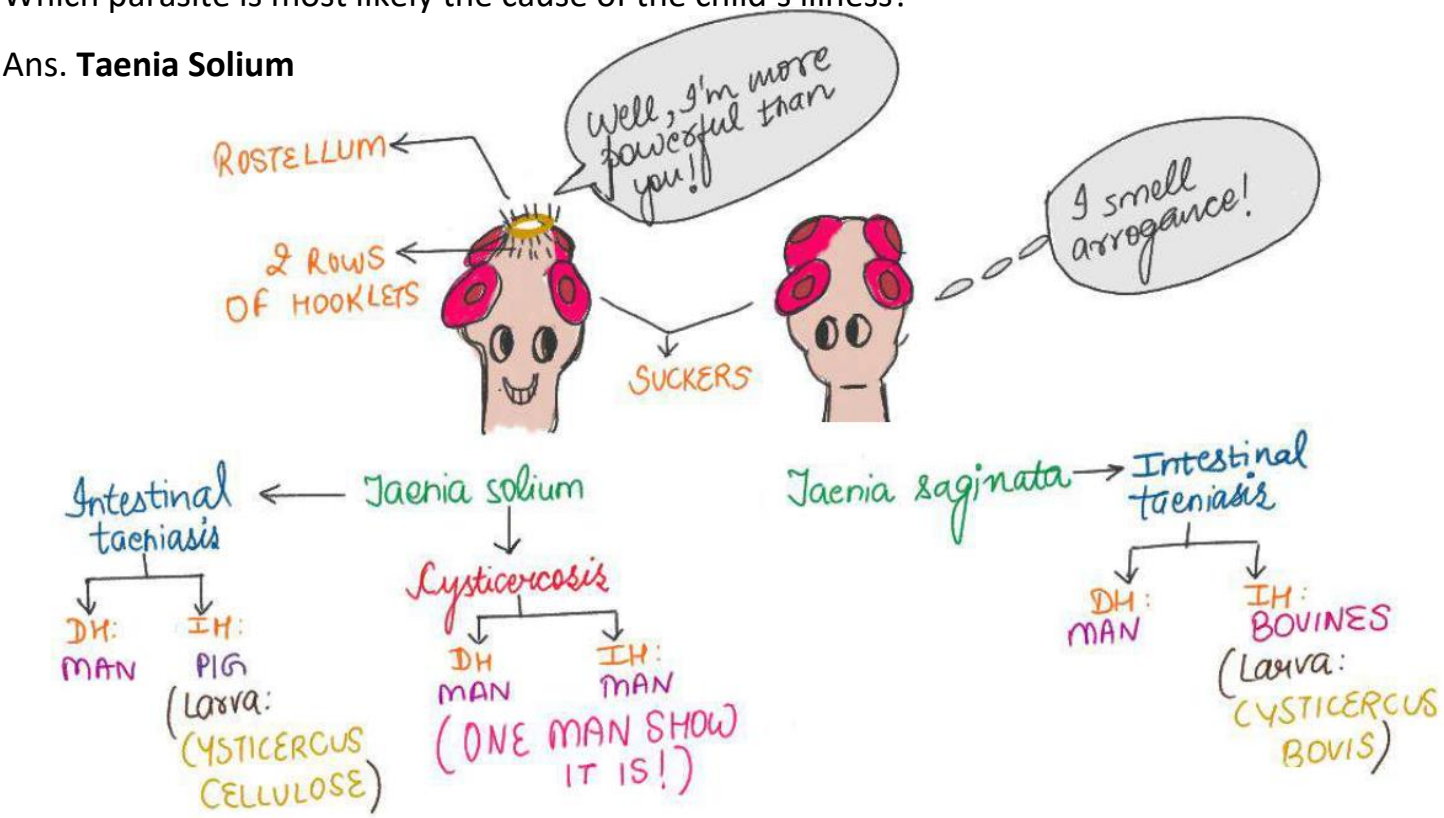
Amphotericin B

Rifampicin
Fluconazole
Miconazole
Azithromycin

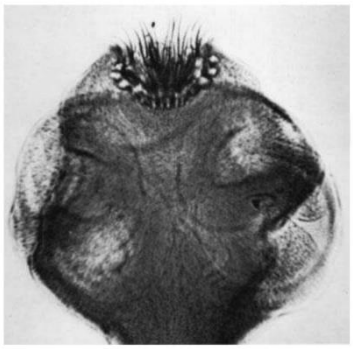
Case 10: A 9-year-old patient—a daughter of a farm labourer—experiences
onset of epileptic seizures. A few pea-sized lipoma like lesions are undeniably palpable in her subcutaneous tissue of her torso and limbs. Excision of two of these lesions reveals parasites (shown in the image). These parasites are active when placed in warm saline.

MRI demonstrates similar lesions in the CNS, and an immunoblot assay is positive for the suspected parasitic disease. Of interest is the discovery of taeniid ova in the stool of her father. Which parasite is most likely the cause of the child's illness?

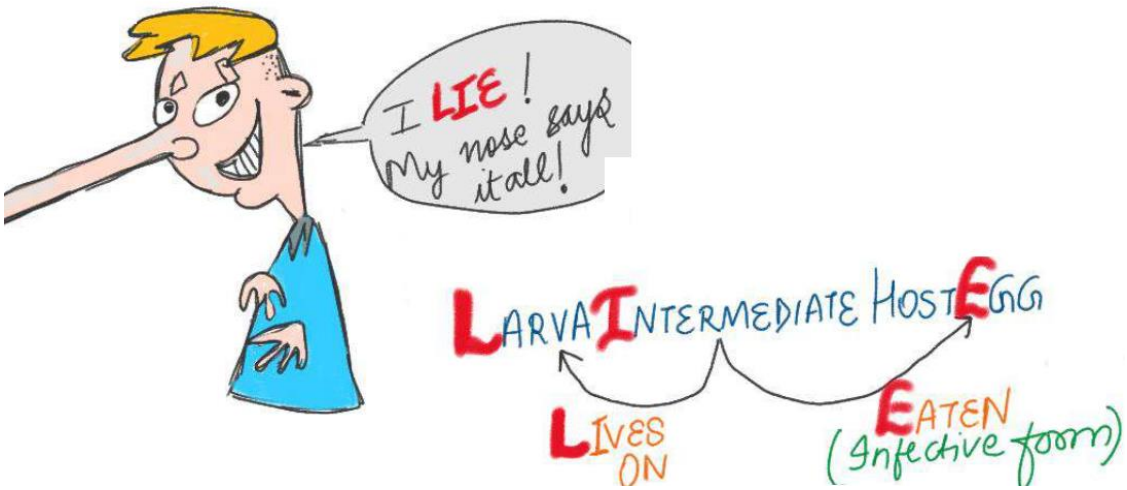
Ans. **Taenia Solium**

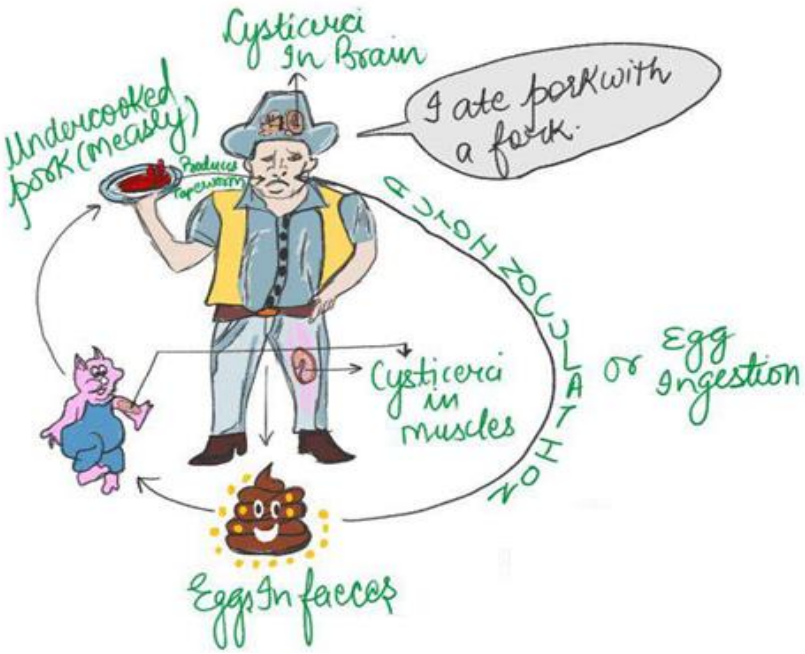


SCOLEX OF *TAENIA SOLIUM*



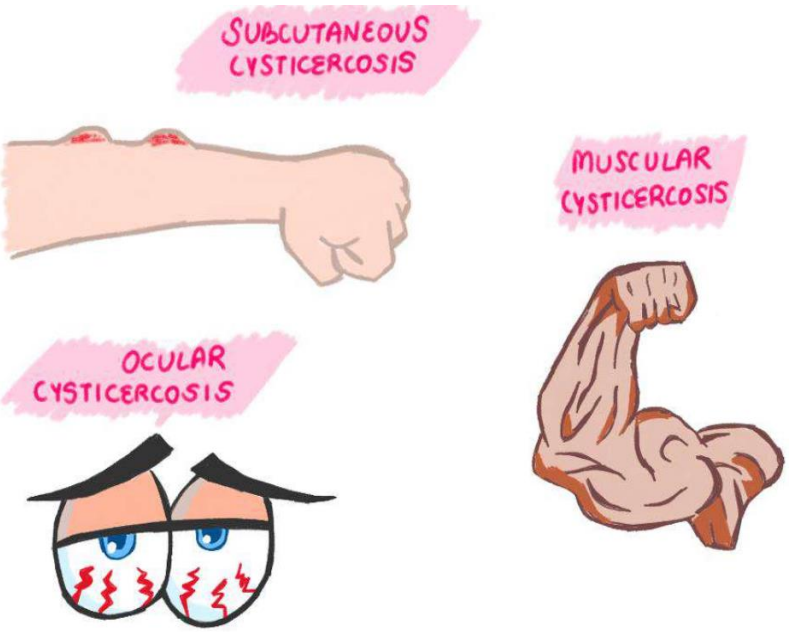
EGG OF *TAENIA* SPP. IN SALINE MOUNT



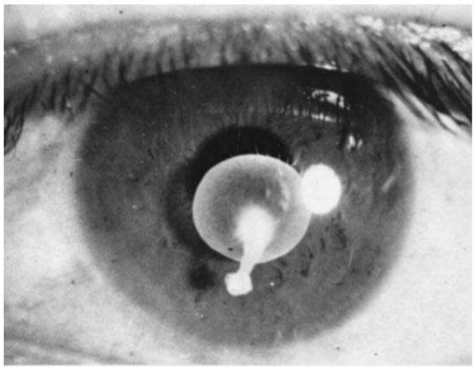


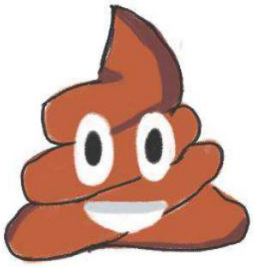
SCOLEX OF *TAENIA SAGINATA*

CYSTICERCUS CELLULOSAE (SURGICALLY REMOVED)



CYSTICERCUS IN THE EYE



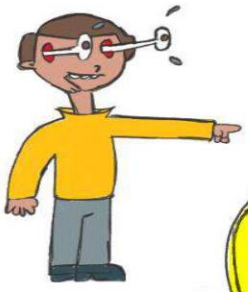


POOP

HAS

PROGLOTTIDS

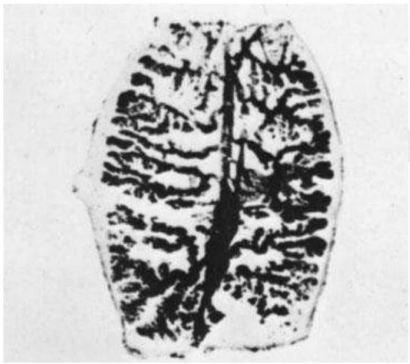
OVA



ACID FAST: T. SAGINATA EGGS

BILE-STAINED: EGGS OF BOTH SPECIES

GRAVID PROGLOTTID OF *TAENIA SOLIUM*



℞:

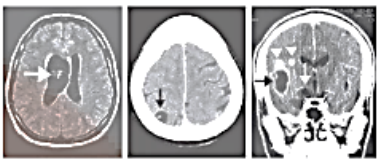
NEUROCYSTICERCOSIS:
ALBENDAZOLE / PRAZIQUANTEL

BEND THE WORM :)

PRAISE THE QUANTITY OF PROGLOTTIDS

Neurocysticercosis

seizures or hydrocephalus



Anticonvulsant therapy

ALBENDAZOLE (15 mg/kg per day for8–28 days)
Or
PRAZIQUANTEL (50–100 mg/kg daily in three divided Doses for 15–30 days).

A COMBINATION OF ALBENDAZOLE AND PRAZIQUANTEL
(50 mg/kg per day) is more effective in patients with more than two cystic lesions.

Glucocorticoids

Endoscopic surgical -

Removal of the cysticercus.

Ventriculoperitoneal shunting